

WHAT IS CLAIMED IS:

1                   1.    A receiver comprising:  
2                    an equalizer;  
3                    a decoder arranged to decode data from a signal,  
4 wherein the signal is based upon an output of the equalizer;  
5                    an encoder arranged to re-encode the decoded data;  
6                    an error generator arranged to generate an error  
7 based upon the signal and the re-encoded data and to weight  
8 the error according to a reliability that the decoder  
9 accurately decoded the data from the signal; and,  
10                  a controller arranged to control the equalizer in  
11 response to the weighted error.

1                   2.    The receiver of claim 1 wherein the re-  
2 encoded data correspond to a plurality of first data  
3 elements, wherein a first portion of the first data elements  
4 designates a sign, wherein a second portion of the first  
5 data elements designates a plurality of second data  
6 elements, wherein a third portion of the first data elements  
7 designates a plurality of third data elements, wherein the  
8 encoder supplies an output, and wherein the output of the

9 encoder includes a plurality of fourth data elements derived  
10 from the sign and the second and third data elements.

1 3. The receiver of claim 2 wherein the fourth  
2 data elements are derived by multiplying the second and  
3 third data elements and by applying the sign to a result of  
4 the multiplication.

1 4. The receiver of claim 2 wherein the second  
2 data elements correspond to a coset leader, and wherein the  
3 third data elements correspond to a Walsh function.

1 5. The receiver of claim 4 wherein the fourth  
2 data elements are derived by multiplying the second and  
3 third data elements and by applying the sign to a result of  
4 the multiplication.

1 6. The receiver of claim 1 wherein the decoder  
2 performs a Walsh transform.

1           7.    The receiver of claim 1 wherein the signal  
2 includes a code vector, wherein the code vector is one of a  
3 plurality of code vectors divided into cosets, and wherein  
4 the decoder correlates the code vector with a coset leader  
5 uniquely corresponding to each coset.

1           8.    The receiver of claim 7 wherein the re-  
2 encoded data correspond to a plurality of first data  
3 elements, wherein a first portion of the first data elements  
4 designates a sign, wherein a second portion of the first  
5 data elements designates a plurality of second data elements  
6 corresponding to one of the coset leaders, wherein a third  
7 portion of the first data elements designates a plurality of  
8 third data elements, wherein the encoder supplies an output,  
9 and wherein the output of the encoder includes a plurality  
10 of fourth data elements derived from the sign and the second  
11 and third data elements.

1           9.    The receiver of claim 8 wherein the fourth  
2 data elements are derived by vector multiplying the second  
3 and third data elements and by applying the sign to a result  
4 of the multiplication.

1                   10. The receiver of claim 9 wherein the decoder  
2 performs Walsh transforms, and wherein the third data  
3 elements correspond to a Walsh function.

1                   11. The receiver of claim 7 wherein the code  
2 vector is a Kerdock code vector.

1                   12. The receiver of claim 1 wherein the decoder  
2 produces correlation peaks from the signal and references.

1                   13. The receiver of claim 12 wherein the  
2 reliability is based upon a largest one of the correlation  
3 peaks.

1                   14. The receiver of claim 12 wherein the  
2 reliability is based upon a comparison between a square of a  
3 correlation peak having the largest magnitude and a square  
4 of a correlation peak having the next largest magnitude.

1           15. The receiver of claim 12 wherein the  
2 reliability is based upon a comparison between a correlation  
3 peak having the largest magnitude and a correlation peak  
4 having the next largest magnitude.

1           16. The receiver of claim 15 wherein the signal  
2 includes a code vector, wherein the code vector is one of a  
3 plurality of code vectors divided into cosets, and wherein  
4 the references are coset leaders uniquely corresponding to  
5 the cosets.

1           17. The receiver of claim 16 wherein the decoder  
2 multiplies the signal by the coset leaders, and wherein the  
3 decoder performs corresponding Walsh transforms on results  
4 of the multiplications.

1           18. The receiver of claim 16 wherein the re-  
2 encoded data correspond to a plurality of first data  
3 elements, wherein a first portion of the first data elements  
4 designates a sign, wherein a second portion of the first  
5 data elements designates a plurality of second data elements  
6 corresponding to one of the coset leaders, wherein a third

7 portion of the first data elements designates a plurality of  
8 third data elements, wherein the encoder supplies an output,  
9 and wherein the output of the encoder includes a plurality  
10 of fourth data elements derived from the sign and the second  
11 and third data elements.

1 19. The receiver of claim 18 wherein the fourth  
2 data elements are derived by vector multiplying the second  
3 and third data elements and by applying the sign to a result  
4 of the multiplication.

1 20. The receiver of claim 19 wherein the decoder  
2 performs Walsh transforms, and wherein the third data  
3 elements correspond to a Walsh function.

1 21. The receiver of claim 16 wherein the code  
2 vector is a Kerdock code vector.

1 22. The receiver of claim 1 wherein the  
2 controller is an LMS adaptive controller.

1           23.    The receiver of claim 1 wherein the decoder  
2 produces a soft output comprising data and a reliability  
3 factor.

1           24.    An electrical signal representing a plurality  
2 of first data elements, wherein a first portion of the first  
3 data elements designates a sign, wherein a second portion of  
4 the first data elements designates a plurality of second  
5 data elements, wherein a third portion of the first data  
6 elements designates a plurality of third data elements, and  
7 wherein the electrical signal includes a plurality of fourth  
8 data elements derived from the sign and the second and third  
9 data elements.

1           25.    The electrical signal of claim 24 wherein the  
2 fourth data elements are derived by multiplying the second  
3 and third data elements and by applying the sign to a result  
4 of the multiplication.

1           26. The electrical signal of claim 24 wherein the  
2 second data elements correspond to a coset leader, and  
3 wherein the third data elements correspond to a Walsh  
4 function.

1           27. The electrical signal of claim 26 wherein the  
2 fourth data elements are derived by multiplying the second  
3 and third data elements and by applying the sign to a result  
4 of the multiplication.

1           28. The electrical signal of claim 24 wherein the  
2 fourth data elements comprise a code vector.

1           29. The electrical signal of claim 28 wherein the  
2 code vector is one of a plurality of code vectors divided  
3 into cosets, and wherein each coset has a coset leader  
4 uniquely corresponding to its coset.

1           30. The electrical signal of claim 29 wherein the  
2 fourth data elements are derived by vector multiplying the  
3 second and third data elements and by applying the sign to a  
4 result of the multiplication.



1                   31. The electrical signal of claim 29 wherein the  
2 second data elements correspond to one of the coset leaders,  
3 and wherein the third data elements correspond to a Walsh  
4 function.

1                   32. The electrical signal of claim 31 wherein the  
2 fourth data elements are derived by vector multiplying the  
3 second and third data elements and by applying the sign to a  
4 result of the multiplication.

1                   33. The electrical signal of claim 32 wherein the  
2 code vector is a Kerdock code vector.

1                   34. A method comprising:  
2 decoding data from a data signal, wherein the data  
3 signal is based upon an output of an equalizer;  
4 re-encoding the decoded data;  
5 providing a feedback signal based upon the data  
6 signal, the re-encoded data, and a reliability that the  
7 decoding of the data from the data signal is performed  
8 accurately; and,

9                   controlling the equalizer in response to the  
10                  feedback signal.

1                   35. The method of claim 34 wherein the decoding  
2                  of data from the data signal comprises re-encoding the  
3                  decoded data according to first, second, and third portions  
4                  of the decoded data, wherein the first portion designates a  
5                  sign, wherein the second portion designates first data, and  
6                  wherein the third portion designates second data.

1                   36. The method of claim 35 wherein the decoding  
2                  of data from the data signal comprises multiplying the first  
3                  and second data and applying the sign to a result of the  
4                  multiplication.

1                   37. The method of claim 35 wherein the first data  
2                  correspond to a coset leader, and wherein the second data  
3                  correspond to a Walsh function.

1                   38. The method of claim 37 wherein the decoding  
2 of data from the data signal comprises multiplying the first  
3 and second data and applying the sign to a result of the  
4 multiplication.

1                   39. The method of claim 34 wherein the decoding  
2 of data from the data signal comprises applying a Walsh  
3 transform to the data signal.

1                   40. The method of claim 34 wherein the data  
2 signal includes a received code vector.

1                   41. The method of claim 40 wherein the received  
2 code vector is one of a plurality of code vectors divided  
3 into cosets, and wherein the decoding of data from the data  
4 signal comprises multiplying the received code vector by a  
5 coset leader uniquely corresponding to each coset.

1                   42. The method of claim 41 wherein the re-  
2 encoding of the decoded data comprises re-encoding the  
3 decoded data according to first, second, and third portions  
4 of the decoded data, wherein the first portion designates a

5 sign, wherein the second portion designates first data, and  
6 wherein the third portion designates second data.

1 43. The method of claim 42 wherein the re-  
2 encoding of the decoded data comprises multiplying the first  
3 and second data and applying the sign to a result of the  
4 multiplication.

1 44. The method of claim 42 wherein the first data  
2 correspond to one of the coset leaders, and wherein the  
3 second data correspond to a Walsh function.

1 45. The method of claim 44 wherein the re-  
2 encoding of the decoded data comprises multiplying the first  
3 and second data and applying the sign to a result of the  
4 multiplication.

1 46. The method of claim 45 wherein the  
2 multiplying of the first and second data comprises vector  
3 multiplying the first and second data.

1                   47. The method of claim 41 wherein the decoding  
2 of data from the data signal comprises performing Walsh  
3 transforms, and wherein the second data correspond to a  
4 Walsh function.

1                   48. The method of claim 40 wherein the code  
2 vector is a Kerdock code vector.

1                   49. The method of claim 34 wherein the decoding  
2 of data from the data signal comprises correlating the data  
3 signal with references to generate correlation peaks.

1                   50. The method of claim 49 wherein the decoding  
2 of data from the data signal comprises determining the data  
3 based upon a largest correlation peak.

1                   51. The method of claim 49 wherein the providing  
2 of a feedback signal comprises weighting the feedback signal  
3 according to a largest correlation peak.

1           52. The method of claim 49 wherein the providing  
2 of a feedback signal comprises weighting the feedback signal  
3 according to a comparison of a largest correlation peak to a  
4 next largest correlation peak.

1           53. The method of claim 49 wherein the providing  
2 of a feedback signal comprises weighting the feedback signal  
3 according to a comparison of a square of a largest  
4 correlation peak to a square of a next largest correlation  
5 peak.

1           54. The method of claim 49 wherein the data  
2 signal includes a code vector, wherein the code vector is  
3 one of a plurality of code vectors divided into cosets, and  
4 wherein the correlating of the data signal with references  
5 comprises multiplying the received code vector by a coset  
6 leader uniquely corresponding to each coset.

1           55. The method of claim 54 wherein the  
2 correlating of the data signal with references comprises  
3 performing Walsh transforms on results of multiplying the  
4 received code vector by a coset leader uniquely corre-

5 sponding to each coset, and wherein the second data  
6 correspond to a Walsh function.

1 56. The method of claim 54 wherein the re-  
2 encoding of the decoded data comprises re-encoding the  
3 decoded data according to first, second, and third portions  
4 of the decoded data, wherein the first portion designates a  
5 sign, wherein the second portion designates first data, and  
6 wherein the third portion designates second data.

1 57. The method of claim 56 wherein the re-  
2 encoding of the decoded data comprises multiplying the first  
3 and second data and applying the sign to a result of the  
4 multiplication.

1 58. The method of claim 56 wherein the first data  
2 correspond to a coset leader, and wherein the second data  
3 correspond to a Walsh function.

1                   59. The method of claim 58 wherein the re-  
2                   encoding of the decoded data comprises multiplying the first  
3                   and second data and applying the sign to a result of the  
4                   multiplication.